

February 4, 1999

TO: Klamath River Technical Advisory Team

FROM: Hoopa Valley Tribal Fisheries Department  
Yurok Tribal Fisheries Department

SUBJECT: 1998 Klamath River fall chinook age composition

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Attached are the results of the Klamath-Trinity Basin age composition project for the 1998 fall chinook run. This project was a joint venture between the Hoopa Valley Tribe, the Yurok Tribe and the U.S. Fish and Wildlife Service (USFWS). The Hoopa Valley Tribe was responsible for scale analysis for the Trinity River, and the Yurok Tribe was responsible for the Klamath Basin. The U.S. Fish and Wildlife Service provided assistance to the Yurok Tribe.

A total of 10,057 scale samples from 16 different sampling locations were examined to estimate age composition for the total in-river run (Tables 1 and 2). Scales were aged twice independently. A third aging was required to resolve any discrepancies between the two primary readers. A total of 1,987 of the scale samples were either excluded or deemed unusable due to scale re-absorption, regeneration, missing scales, inconclusive age estimates or they were coded wire tagged (CWT) fish non-randomly sampled at Iron Gate Hatchery.

Scale samples from known-age CWT fish were aged to determine error associated with the aging project. These scales were distributed throughout the Klamath Basin project, in an attempt to reflect error throughout the aging process. Of the Klamath Basin scales aged, all (n=4) of the age two fish were correctly aged, 96% (n= 277) of the age three fish were correctly aged, 74% (n=125) of the age 4 fish were correctly aged and 83% (n=6) of the age five fish were aged correctly. Reader error was adjusted for bias using a maximum likelihood estimator described by Kimura and Chikuni (1987).

Analysis of scale reader error for the Trinity River Basin indicated that scale readers aged known age fish with 95% accuracy. However, approximately 19% of the known age 4 fish were read as age 3. While, known age 5 fish were aged as age 4 approximately 60% of the time. Reader error in the Trinity Basin was adjusted for bias using the above mentioned maximum likelihood estimator.

Scales collected from the Yurok Tribal fishery, the lower river recreational fishery and Hoopa Tribal fishery prior to August 20 were not used for the project. Coded wire tag recoveries indicated that most of the fish harvested prior to this time were spring-run chinook. Scales collected from the Willow Creek weir prior to September 17 and from Trinity River Hatchery prior to October 29 were also excluded from the analysis because spring-run chinook comprised a component of the population prior to these dates.

Two year old fish (jacks) numbers were taken from the most current information available, which included the 1998 mega-table and revisions to the mega-table information. The number of jacks recorded in the mega-table was primarily determined by length-frequency distributions, combined with coded wire tag information to determine the age 2 length cutoff. The proportion of fish belonging to age classes 3, 4, and 5 was adjusted so that the sum of all ages totaled 100%. An exception was that the number of jacks from Iron Gate Hatchery was determined by the age composition project due to low precision in classifying jacks at the hatchery according to length and the fact that age-3 fish were much smaller this year relative to the accepted standard of greater than 55 cm.

In fisheries and areas where an insufficient number of scales were collected, the age composition of areas that were believed to best represent the under-sampled areas were used as surrogates. This was done by weighting the age composition of the surrogate areas according to their escapement. Areas where surrogates were used are labeled accordingly in Tables 2 and 3. The unmonitored recreational fishery from Coon Creek to Iron Gate Hatchery was assumed to contain the same proportion of two year old fish as the lower river recreational fishery. The Shasta, Scott and Salmon River surrogate was assumed to represent the adult component of this fishery.

The portions of the population that contained coded wire tags were portioned by age using the coded-wire tag information. Portions of the escapement not bearing tags were portioned by age using scale samples from randomly sampled fish

The Trinity Basin natural escapement was apportioned by age as follows: The total combined natural and hatchery escapement was apportioned using scale samples from the Willow Creek Weir. The age specific escapement at Trinity River Hatchery was then subtracted from the total upriver escapement at age to arrive at the net natural escapement by age. The entire Trinity River recreational fishery portion was apportioned by age using scale samples from the Hoopa Tribal Creel census program below Willow Creek Weir.

The final results for the 1998 Klamath River Basin in-river age composition after the applicable correction factor was applied resulted as follows:

|                              |         |
|------------------------------|---------|
| 2 year olds, brood year 1995 | (4.9%)  |
| 3 year olds, brood year 1994 | (61.8%) |
| 4 year olds, brood year 1993 | (31.5%) |
| 5 year olds, brood year 1992 | (1.8%)  |

#### Literature Cited

Kimura, D.K. and Chikuni, S. 1987. Mixtures of Empirical Distributions: An Iterative Application of the Age-Length Key. *Biometrics* 43, 23-35.

Table 1. Scale sampling locations and numbers of samples provided for the 1998 Klamath River Fall chinook age composition.

| Sampling Location                                  | # Samples | Used   | Not Used | Agency     |
|----------------------------------------------------|-----------|--------|----------|------------|
| Iron Gate Hatchery (IGH)                           | 1,279     | 546    | 733      | CDFG       |
| Trinity River Hatchery (TRH)                       | 3,335     | 2,835  | 500      | CDFG       |
| Salmon River Carcass Survey                        | 231       | 215    | 16       | USFS, CDFG |
| Scott River Carcass Survey                         | 480       | 425    | 55       | USFS, CDFG |
| Shasta River Weir & Carcass                        | 346       | 301    | 45       | USFS, CDFG |
| Bogus Creek Weir                                   | 626       | 487    | 139      | CDFG       |
| Willow Creek Weir                                  | 1,191     | 1,172  | 19       | CDFG       |
| Trinity River Carcass Survey                       | 0         | 0      | 0        | CDFG       |
| Trinity River Tributaries                          | 46        | 46     | 0        | USFS       |
| Mainstem Klamath River                             | 0         | 0      | 0        |            |
| Lower Klamath River Creel Census                   | 1,067     | 952    | 115      | CDFG       |
| Lower Trinity Creel                                | 264       | 260    | 4        | HVT        |
| Hoopa Tribal Net Harvest                           | 310       | 305    | 5        | HVT        |
| Yurok Tribal Net Harvest (Mouth to Hwy 101)        | 1,302     | 1,130  | 172      | YTFF       |
| Yurok Tribal Net Harvest (Hwy 101 to Surpur Creek) | 386       | 356    | 30       | YTFF       |
| Yurok Tribal Net Harvest (Surper to Weitchpec)     | 1,181     | 1,027  | 154      | YTFF       |
| TOTALS                                             | 12,044    | 10,057 | 1,987    |            |

Table 2. Age Composition of the 1998 Klamath River fall chinook run.

| Surrogate<br>Scale Samples<br>Utilized |                                         | AGE          |               |               |              | Total<br>Adults | Total         |
|----------------------------------------|-----------------------------------------|--------------|---------------|---------------|--------------|-----------------|---------------|
|                                        |                                         | 2            | 3             | 4             | 5            |                 |               |
| IBSSS                                  | <b>Hatchery Spawners</b>                |              |               |               |              |                 |               |
|                                        | Iron Gate Hatchery (IGH)                | 403          | 7,519         | 7,273         | 131          | 14,923          | 15,326        |
|                                        | Trinity River (TRH)                     | 192          | 12,892        | 1,315         | 89           | 14,296          | 14,488        |
|                                        | <b>Subtotals</b>                        | <b>595</b>   | <b>20,411</b> | <b>8,588</b>  | <b>220</b>   | <b>29,219</b>   | <b>29,814</b> |
|                                        | <b>Natural Spawners</b>                 |              |               |               |              |                 |               |
|                                        | Trinity River basin                     |              |               |               |              |                 |               |
|                                        | (above Willow Creek, excluding TRH)     | 1,912        | 21,193        | 3,053         | 162          | 24,408          | 26,320        |
|                                        | Salmon River basin                      | 115          | 699           | 578           | 46           | 1,323           | 1,438         |
|                                        | Scott River basin                       | 268          | 1,948         | 1,003         | 134          | 3,085           | 3,353         |
|                                        | Shasta River Basin                      | 76           | 1,711         | 754           | 0            | 2,466           | 2,542         |
|                                        | Bogus Creek Basin                       | 201          | 1,954         | 4,494         | 67           | 6,515           | 6,716         |
|                                        | Main Stem Klamath River                 |              |               |               |              |                 |               |
|                                        | (excluding IGH)                         | 109          | 1,423         | 1,451         | 39           | 2,913           | 3,022         |
|                                        | Misc. Klamath Tributaries               |              |               |               |              |                 |               |
|                                        | (above Hoopa and Yurok Reservations)    | 72           | 686           | 368           | 28           | 1,083           | 1,155         |
| SSS                                    | Hoopa and Yurok Reservation Tribs.      | 23           | 222           | 119           | 9            | 350             | 373           |
| SSS                                    | <b>Subtotals</b>                        | <b>2,778</b> | <b>29,836</b> | <b>11,819</b> | <b>486</b>   | <b>42,141</b>   | <b>44,919</b> |
|                                        | <b>Total Spawner Escapement</b>         | <b>3,373</b> | <b>50,247</b> | <b>20,406</b> | <b>706</b>   | <b>71,360</b>   | <b>74,733</b> |
| IBSSS                                  | <b>Angler Harvest</b>                   |              |               |               |              |                 |               |
|                                        | Klamath River(below Hwy 101 bridge)     | 114          | 885           | 402           | 12           | 1,299           | 1,413         |
|                                        | Klamath River (Hwy 101 to Coon Crk.)    | 412          | 874           | 397           | 12           | 1,283           | 1,695         |
|                                        | Trinity River(above Willow Creek)       | 235          | 3,245         | 156           | 63           | 3,464           | 3,698         |
|                                        | Balance of Klamath System               | 322          | 773           | 788           | 21           | 1,583           | 1,905         |
|                                        | <b>Subtotals</b>                        | <b>1,083</b> | <b>5,777</b>  | <b>1,744</b>  | <b>109</b>   | <b>7,629</b>    | <b>8,711</b>  |
|                                        | <b>Indian Net Harvest</b>               |              |               |               |              |                 |               |
|                                        | Klamath River(below Hwy 101)            | 16           | 617           | 2,557         | 272          | 3,445           | 3,461         |
|                                        | Klamath River(Hwy 101 to Trinity mouth) | 32           | 761           | 4,036         | 329          | 5,127           | 5,159         |
|                                        | Trinity River(Hoopa Reservation)        | 99           | 778           | 470           | 172          | 1,420           | 1,519         |
|                                        | <b>Subtotals</b>                        | <b>147</b>   | <b>2,156</b>  | <b>7,063</b>  | <b>773</b>   | <b>9,992</b>    | <b>10,139</b> |
|                                        | <b>Total in-river Harvest</b>           | <b>1,230</b> | <b>7,933</b>  | <b>8,806</b>  | <b>882</b>   | <b>17,621</b>   | <b>18,850</b> |
|                                        | <b>Totals</b>                           |              |               |               |              |                 |               |
|                                        | In-River Harvest and Escapement         | <b>4,603</b> | <b>58,180</b> | <b>29,212</b> | <b>1,588</b> | <b>88,981</b>   | <b>93,584</b> |
|                                        | Angling Mortality (2% of harvest)       | 22           | 116           | 35            | 2            | 153             | 174           |
|                                        | Net Mortality (8% of harvest)           | 12           | 172           | 565           | 62           | 799             | 811           |
|                                        | <b>Total In-river Run</b>               | <b>4,637</b> | <b>58,468</b> | <b>29,812</b> | <b>1,652</b> | <b>89,933</b>   | <b>94,569</b> |

IBSSS = Iron Gate Hatchery, Bogus Creek, Shasta R., Scott R., Salmon R.

SSS = Shasta R., Scott R., Salmon R.

KR Creel = Entire Klamath R. creel census

Table 3. Age Composition (percentages) of the 1998 Klamath River fall chinook run.

| Surrogate<br>Scale Samples<br>Utilized |                                                                   | AGE    |        |        |        | Total<br>Adults | Total   |
|----------------------------------------|-------------------------------------------------------------------|--------|--------|--------|--------|-----------------|---------|
|                                        |                                                                   | 2      | 3      | 4      | 5      |                 |         |
| IBSSS                                  | <b>Hatchery Spawners</b>                                          |        |        |        |        |                 |         |
|                                        | Iron Gate Hatchery (IGH)                                          | 2.63%  | 49.06% | 47.45% | 0.86%  | 97.37%          | 100.00% |
|                                        | Trinity River (TRH)                                               | 1.33%  | 88.98% | 9.08%  | 0.61%  | 98.67%          | 100.00% |
|                                        | <b>Subtotals</b>                                                  | 2.00%  | 68.46% | 28.80% | 0.74%  | 98.00%          | 100.00% |
|                                        | <b>Natural Spawners</b>                                           |        |        |        |        |                 |         |
|                                        | Trinity River basin                                               |        |        |        |        |                 |         |
|                                        | (above Willow Creek, excluding TRH)                               | 7.26%  | 80.52% | 11.60% | 0.62%  | 92.74%          | 100.00% |
|                                        | Salmon River basin                                                | 8.00%  | 48.60% | 40.19% | 3.21%  | 92.00%          | 100.00% |
|                                        | Scott River basin                                                 | 8.00%  | 58.09% | 29.90% | 4.01%  | 92.00%          | 100.00% |
|                                        | Shasta River Basin                                                | 3.00%  | 67.32% | 29.68% | 0.00%  | 97.00%          | 100.00% |
|                                        | Bogus Creek Basin                                                 | 3.00%  | 29.09% | 66.91% | 1.00%  | 97.00%          | 100.00% |
|                                        | Main Stem Klamath River<br>(excluding IGH)                        | 3.62%  | 47.08% | 48.00% | 1.29%  | 96.38%          | 100.00% |
|                                        | Misc. Klamath Tributaries<br>(above Hoopa and Yurok Reservations) | 6.27%  | 59.43% | 31.84% | 2.46%  | 93.73%          | 100.00% |
|                                        | Hoopa and Yurok Reservation Tribs.                                | 6.27%  | 59.43% | 31.84% | 2.46%  | 93.73%          | 100.00% |
|                                        | <b>Subtotals</b>                                                  | 6.19%  | 66.42% | 26.31% | 1.08%  | 93.81%          | 100.00% |
| IBSSS                                  | <b>Total Spawner Escapement</b>                                   | 4.51%  | 67.24% | 27.31% | 0.95%  | 95.49%          | 100.00% |
|                                        | <b>Angler Harvest</b>                                             |        |        |        |        |                 |         |
|                                        | Klamath River(below Hwy 101 bridge)                               | 8.07%  | 62.60% | 28.45% | 0.88%  | 91.93%          | 100.00% |
|                                        | Klamath River (Hwy 101 to Coon Crk.)                              | 24.31% | 51.54% | 23.43% | 0.73%  | 75.69%          | 100.00% |
|                                        | Trinity River(above Willow Creek)                                 | 6.35%  | 87.75% | 4.22%  | 1.70%  | 93.67%          | 100.03% |
|                                        | Balance of Klamath System                                         | 16.90% | 40.60% | 41.39% | 1.11%  | 83.10%          | 100.00% |
|                                        | <b>Subtotals</b>                                                  | 12.43% | 66.31% | 20.02% | 1.25%  | 87.58%          | 100.01% |
|                                        | <b>Indian Net Harvest</b>                                         |        |        |        |        |                 |         |
|                                        | Klamath River(below Hwy 101)                                      | 0.46%  | 17.82% | 73.87% | 7.85%  | 99.54%          | 100.00% |
|                                        | Klamath River(Hwy 101 to Trinity mouth)                           | 0.62%  | 14.76% | 78.23% | 6.39%  | 99.38%          | 100.00% |
|                                        | Trinity River(Hoopa Reservation)                                  | 6.52%  | 51.22% | 30.94% | 11.32% | 93.48%          | 100.00% |
|                                        | <b>Subtotals</b>                                                  | 1.45%  | 21.27% | 69.66% | 7.63%  | 98.55%          | 100.00% |
|                                        | <b>Total in-river Harvest</b>                                     | 6.53%  | 42.08% | 46.72% | 4.68%  | 93.48%          | 100.01% |
|                                        | <b>Totals</b>                                                     |        |        |        |        |                 |         |
|                                        | In-River Harvest and Escapement                                   | 4.92%  | 62.17% | 31.22% | 1.70%  | 95.08%          | 100.00% |
|                                        | Angling Mortality (2% of harvest)                                 |        |        |        |        |                 |         |
|                                        | Net Mortality (8% of harvest)                                     |        |        |        |        |                 |         |
|                                        | <b>Total in-river Run</b>                                         | 4.90%  | 61.83% | 31.52% | 1.75%  | 95.10%          | 100.00% |

IBSSS = Iron Gate Hatchery, Bogus Creek, Shasta R., Scott R., Salmon R.

SSS = Shasta R., Scott R., Salmon R.

KR Creel = Entire Klamath R. creel census